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LISTS OF SPECIES

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Fish diversity of a southwestern Atlantic coastal island: aspects of distribution and conservation in a marine zoogeographical boundary

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Abstract: Despite the increase of knowledge about the southwestern Atlantic ichthyofauna, there is still a lack of information along extensive marine areas. The Espírito Santo state (ES) coast, considered a zoogeographic boundary and a transitional zone between tropical and subtropical realms, is still largely unknown. Here is provided a checklist containing 221 fish species at Franceses Island (south coast of ES), which was attained with data from 2000 to 2010 by means of underwater observations, specimen collections and fisheries monitoring. Abundance, habitats and threat risks of each species are shown and discussed. The number of reef fish species found at Franceses Island corresponds approximately to 35% of all fishes present in the Brazilian Province. The conservation of the Franceses Island and surrounding areas would protect a mosaic of environments that can support a high diversity of fish species.

Key words: biogeography, Brazilian Province, Franceses Island, ichthyofauna

INTRODUCTION

Although studies on the Caribbean reef fish fauna began in the 1950s (Hixon 2011), the ichthyofauna of southwestern Atlantic reefs remained largely unknown until the beginning of the 1990s. However, since then, the use of SCUBA for research has contributed for a huge amount of information about Brazilian reef fishes, mainly in respect to taxonomy, community structure, ecology, biogeography and phylogenetics (e.g., Floeter et al. 2001; Joyeux et al. 2001).

Sheltering a large proportion of endemic species (10 %; Floeter et al. 2008), Brazilian reefs constitute a distinct zoogeographic province (Floeter and Gasparini 2000; Floeter et al. 2008) separated of the others by semi-permeable biogeographic filters (Rocha 2003; Luiz et al. 2012). This singularity, associated with the relatively small area that the Brazilian reef environments represent in the Atlantic, turns it as a priority area for studies and conservation programs (Moura 2000).

During the last decade, the number of studies about reef fishes in Brazilian waters extensively increased. Many studies aimed to understand the relationship of community dynamics for distinct environmental factors (Ferreira et al. 2001; Floeter et al. 2007), fishing effects (Floeter et al. 2006) and management rules (Francini-Filho and Moura 2008a, 2008b). Ecological analysis (Sazima et al. 2000; Bonaldo et al. 2006; Ferreira and Gonçalves 2006; Francini-Filho and Sazima 2008; Francini-Filho et al. 2010) and behavioral patterns (Gibran 2002; Sazima 2002; Sazima et al. 2003; Gibran 2004) were also largely performed in different sites of the Brazilian shore. However, regardless the increase in research, an enormous part of the reef environments of Brazil are still lacking basic knowledge (Mendonça-Neto et al. 2008) and protection (Floeter et al. 2006), suffering impacts from population growth, industrial development, fishing activities and inordinate tourism.

In this context, the Espírito Santo state, a faunal biogeographical marine boundary zone situated in the central Brazilian coast (Floeter et al. 2001; Martins et al. 2007), until recently had received few attention by marine researchers and conservation initiatives. Consequently, most coastal reef environments of the state became highly overfished without a basic preterit

knowledge about its fauna (Pinheiro et al. 2010a). Thus, this study contribute with information about reef fishes of a poorly studied area of the central coast of Brazil, analyzing the composition and distribution of fish species that occur in and surrounding Franceses Island´s reefs. Moreover, this is regionally a priority area for a MPA creation and this research raises important data and discussion to contribute for this process.

MATERIAL AND METHODS

The Espírito Santo state (18°22′ S – 21°19′ S), central coast of Brazil, is located in a transitional tropical-subtropical area, where tropical oligotrophic waters of Brazilian current coming from the north predominate, but also with the occurrence of a seasonal coastal upwelling from the south (Schmid et al. 1995). Additionally, the state lies in a boundary area between coral reef ecosystems in the north (00°52′ N – 19° S) and rocky reefs ecosystems in the south (19° S – 28° S) (Floeter et al. 2001). The climate is inter-tropical, with intensive and prolonged rains in summer and dry weather in winter. Predominant winds are from the east and northeast. However, south and southeast winds occur predominantly in the winter (Nimer 1989).

This study was conducted on the rocky shores, reefs and surrounding habitats of Franceses Island (Figure 1; 20°55′ S, 040°45′ W), a coastal island located in Espírito Santo southern coast. The island, formed by a crystalline base, is situated 4 km from the coastline. It has an area of 0.135 km^2 and perimeter of 1,700 m, where its largest axis (500 m of length) is disposed parallel to coastline. The rocky shore has a strong difference in declivity and horizontal extension among its sides. In the western side, sheltered from winds and waves, the rocky shore is narrow and highly abrupt, arising 5 m from its deepest part. In this side the interface is composed of sand and mud. The seascape of the area between the isle and the continent is very shallow (<4 m), and is formed by a mosaic of sand bottoms, macro-algae beds and biogenic reefs and patch-reefs.

In the eastern side, facing the open ocean, the rocky shore is broader and deeper (ca. 120 m and 12 m deep). The interface is constituted by rhodoliths, gravels, bioclastic material and sand. There are also patch reefs few meters from interface of this side. The infralittoral of the island shows an enormous variation of structural complexity due to the presence of big boulders and holes. The isle also has exposed and submersed reefs in northeast face.

The benthic community structure is composed by 31.8% (cover) of zoobenthos, 46.1% of fitobenthos and 22.1% of soft bottom (interface zones) (Costa 2009).

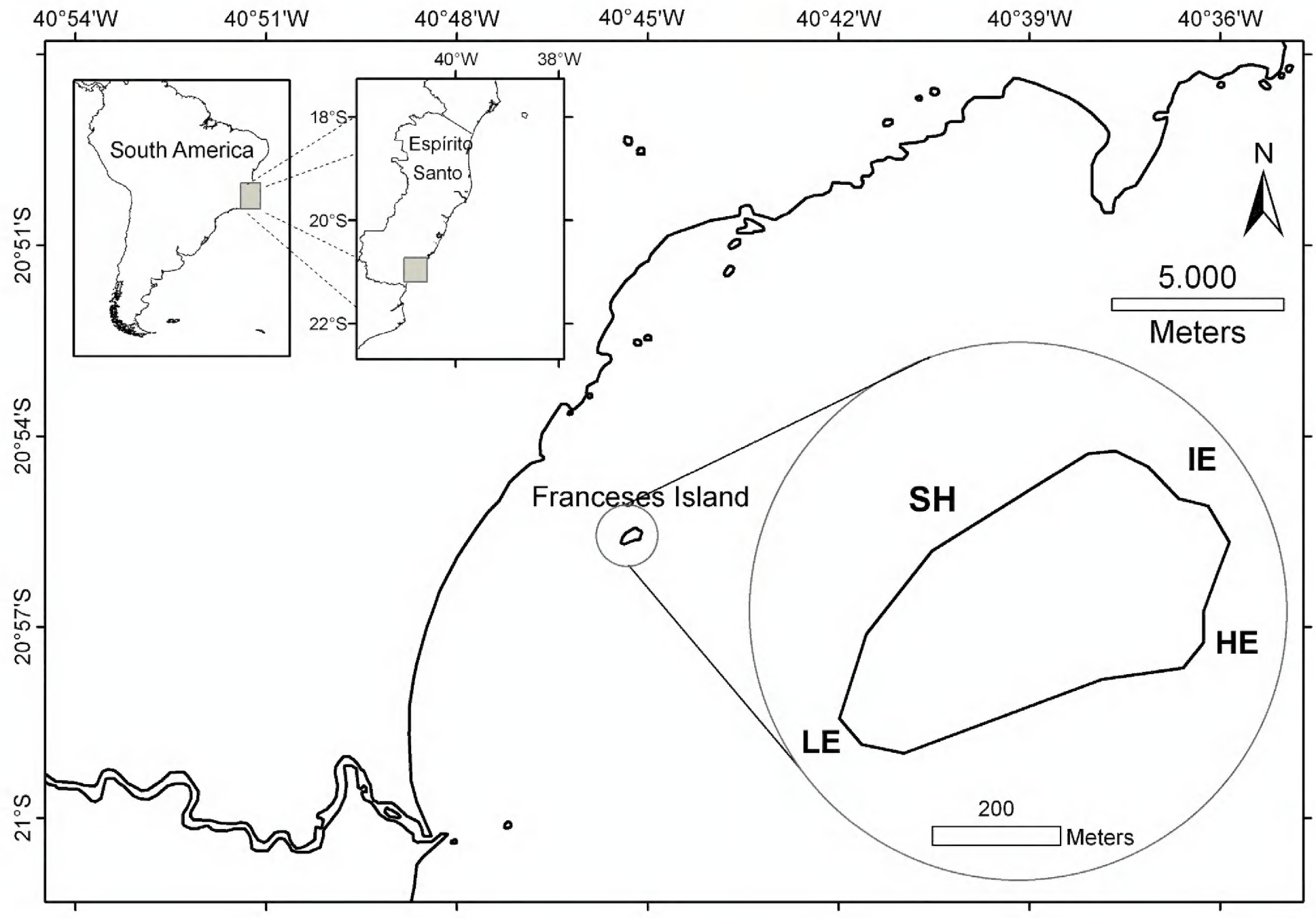

Figure 1. Map of Franceses Island, Espírito Santo state, southeastern Brazil. SH=shelter; LE=Low exposure; IE=intermediate exposure; HE=high exposure to winds and waves.

Turf algae and soft bottom have the highest cover, followed by red algae, brown algae, sponges, briozoans, gorgonians and zoanthids. However, the benthonic cover shows a significant change between sheltered and highly exposed zones. Costa (2009) stated that corals, zoanthids and urchins have the highest cover in sheltered zones, while gorgonians, hydrozoans and macroalgae preferred the higher exposure face.

Additionally, Franceses Island is influenced by two hydrographic basins: Benevente (Anchieta) and Itapemirim rivers (between Marataízes and Itapemirim). These rivers, in raining periods or strong winter winds, contribute to promote turbidity and suspension of particulate material in the island surrounding waters. In the southwest of the island, in a bottom composed of sand, gravel (rhodolith and bioclastic material) and mud, fishermen practice trawl fishing for shrimps (Pinheiro and Martins 2009). The ichthyofauna of this environment was sampled between 2003 and 2004 (see details in Pinheiro et al. 2009a). In the present work this environment is called the soft bottom adjacent to the island (SBA).

Moreover, Franceses Island is situated in an area proposed for creating a MPA. The Brazilian government considers this region as a biological highly important area with an extremely high priority for action (studies and management) (MMA 2007).

The Franceses Island fish checklist results from underwater observations, photographic records and voucher specimens obtained between 2000 and 2010, where about 70 expeditions and 200 days in the field were conducted. Fishing activities were monitored from 2003 to 2006, when bottom trawls (12 embarkments; 30 hours of trawl), seine trawls (15 trawls) and recreational activities (75 fishermen) were studied, and the species caught identified. Recreational activities constituted angling and spearfishing, and both occur in all surrounding island (for details see Pinheiro et al. 2010a), catching specimens in the rocky reefs (RR), interface (IF) and water column (WC) habitats. The bottom trawl was performed by local boats of the shrimp fishery fleet in a fishing ground located between 500 and 1500 m southwest of the island (for details see Pinheiro et al. 2009a and Pinheiro and Martins 2009) in the habitat denominated SBA. The seine trawls were performed from the island and had as target schools of seasonal fishes. The nets used were nearly 400 m long and 5 m high, seining and catching every fish that occurred in the sheltered zone of the island, involving IF, WC and soft bottom of the island (SBI) habitats. Other professional fishing activities, such as gill nets and trolling, were not evaluated.

Families and genera within families are listed in alphabetical order. Some recent taxonomic revisions were adopted, i.e., Epinephelidae separated from Serranidae and Scarinae subsumed in Labridae (Westneat and Alfaro 2005; Craig et al. 2011). Thus, the checklist contains the following information of each species (modified from Luiz et al. 2008):

Abundance: an indicator of the relative abundance based in the several observations realized in each distinct habitat described above; where: AB = abundant (several sightings of many individuals – at least 50 – are expected at nearly every dive or fishing catch), VC = very common (several sightings are expected, but not necessarily of many individuals), CO = common (sights are frequent, but not necessarily expected on every dive or fishing activity monitored), OC = occasional (sightings are not unusual, but are not expected on a regular basis), UN = unusual (sights occurs less than occasionally), and RA = rare (sighted on reefs or in the fishing activities only one time).

Habitat: a particular place where a species lives and was sighted. The habitats were defined by physiographic features as substrate type and depth, of which: RR=rocky reefs (shallow and mid-depth areas of the shores and reefs; ranging from 0 to 12 m deep), IF=interface (interface between reef and adjacent soft bottom; 3 to 12 m deep); SBI=soft bottom of the island (consists mainly of sand, mud or bioclastic material near of the isle, although rhodolith patches are also found; < 100 m from the rocky shore or reefs); WC=water column (pelagic environment of the island from 0 to 8 m of depth); SBA=soft bottom adjacent to the island (composed by sand, mud and gravel ground from the surroundings of the isle to 1.5 km away; 4 to 6 m of depth).

Threat**:** species registered in fishing activities or in red lists of endangered species: PF=species caught by professional fishing activities monitored; RF=species caught by recreational fishing activities monitored; EN=species considered endangered (at risk of extinction, present in the Brazilian list of endangered species; MMA 2014); RO=species considered at risk of over-exploitation (present in the Brazilian list of over-exploited species; IBAMA 2003a, 2003b); IU= species evaluated and considered threatened by the IUCN red list (Critically Endangered, Endangered or Vulnerable); DD=data deficient by IUCN evaluation; NR= species not at risk (those not considered to be threatened by red lists and weren't caught by any fishing activity).

Record type: how the species was registered, where: COL=collected, MUS=museum voucher, LIT=literature, PHO=photograph/video and SIG=sighting. For specimens deposited in museum collections, the institution and voucher number are provided in the Appendix 1.

A cluster analysis of the habitat-types based on a species presence/absence matrix was performed. The Bray-Curtis similarity index was used, and habitats were clustered according to the UPGMA method (Pielou 1984). SIMPROF analysis was performed in order to test

for multivariate structure within the data. Cluster and SIMPROF analysis were made in the software PRIMER v6 (Clarke and Gorley 2006).

RESULTS

A total of 221 species was recorded at Franceses Island and adjacent habitats (Table 1). One hundred sixty-four species (74%) were registered by underwater observations, 77 (35%) being recorded exclusively by this method. On the other hand, 145 species (65%) were registered by fishing activities, 57 (26%) being exclusive by this method.

The richest family was Sciaenidae, with 18 species, followed by Carangidae with 15, Labridae with 13, Haemulidae with nine, Gobiidae with eight and Epinephelidae with seven. Richest genera were *Lutjanus* and *Sparisoma* with five species, followed by *Gymnothorax*, *Caranx*, *Haemulon*, *Cynoscion* and *Sphoeroides* with four each.

Twenty-five species were considered abundant (11%), while 41 were very common (19%), 44 common (20%), 49 occasional (22%), 50 unusual (23%) and only 12 rare (5%) (Table 1). Among all species, 185 (85%) occurred in Franceses Island rocky reefs (RR, IF, WC and SBI habitats), 159 being exclusives. Eighty-six species (39%) occurred in soft bottom habitats (SBI and SBA), 52 being exclusives. Thirty-four species (15%) were found both on soft bottoms (SBI and SBA) and reefs (RR, IF, WC) (Table 1, Figure 2–7).

Habitat dissimilarity analysis shows that the composition of species of each habitat differs strongly from each other (Figure 8; SIMPROF, Global R=11.8, p=0.001). The WC habitat shows the most different composition, while RR and IF have 41 species in common, and SBI and SBA share 17 in common. The highest richness is found in the RR (95 species), followed by IF (67), SBA (63), WC (46) and SBI (45) (Table 1). The RR habitat also has the highest exclusive species richness with 49 species, followed by WC (36), SBA (36), SBI (13) and IF (7) (Figure 8).

Eleven species are present in the IUCN red list: *Balistes vetula*, *Epinephelus itajara*, *Gymnura altavela*, *Lutjanus analis*, *Lutjanus cyanopterus*, *Epinephelus marginatus*, *Pagrus pagrus*, *Rhinobatos horkelii*, *Scarus trispinosus*, *Zapteryx brevirostris*. Fifteen species are considered endangered in Brazilian red list: *E. itajara*, *E. marginatus*, *Myceroperca bonaci*, *Ginglymostoma cirratum*, *Elacatinus figaro*, *Gymnura altavela*, *S. trispinosus*, *Sparisoma amplum*, *S. axillare*, *S. frondosum*, *L. cyanopterus*, *Microspathodon chrysurus*, *R. horkelii*, *Z. brevirostris* and *Hippocampus reidi,* and nine are over-exploited: *Sardinella brasiliensis*, *P. pagrus*, *Ocyurus chrysurus*, *Macrodon ancylodon*, *Micropogonias furnieri*, *L. analis*, *Mugil liza*, *Pomatomus saltatrix* and *E. marginatus*. One hundred and eleven species were recorded in the professional activities, and from these four are present in the IUCN red list, five are considered endangered and six at risk of over-exploitation by Brazilian red lists. Sixty-four species were recorded in recreational activities (31 in angling and 48 in spear fishing practices), and from these seven are present in IUCN red list, eight are endangered and four at risk of over-exploitation by Brazilian red lists. Seven species present in Franceses island are considered data deficient by IUCN evaluation (Table 1).

DISCUSSION

Along the Brazilian coast, at least 437 fish species occur in reef environments (Floeter et al. 2008), and the reef fishes found at Franceses Island and adjacent habitats (154 species, *sensu* Floeter et al. 2008) represent about 35% of the Brazilian province reef fish species. Although species diversity is influenced by biogeographic and latitudinal gradients (Floeter et al. 2004, 2008), it also shows a close relation with the local habitat diversity in each area (Cornell and Karlson 2000). Franceses Island,

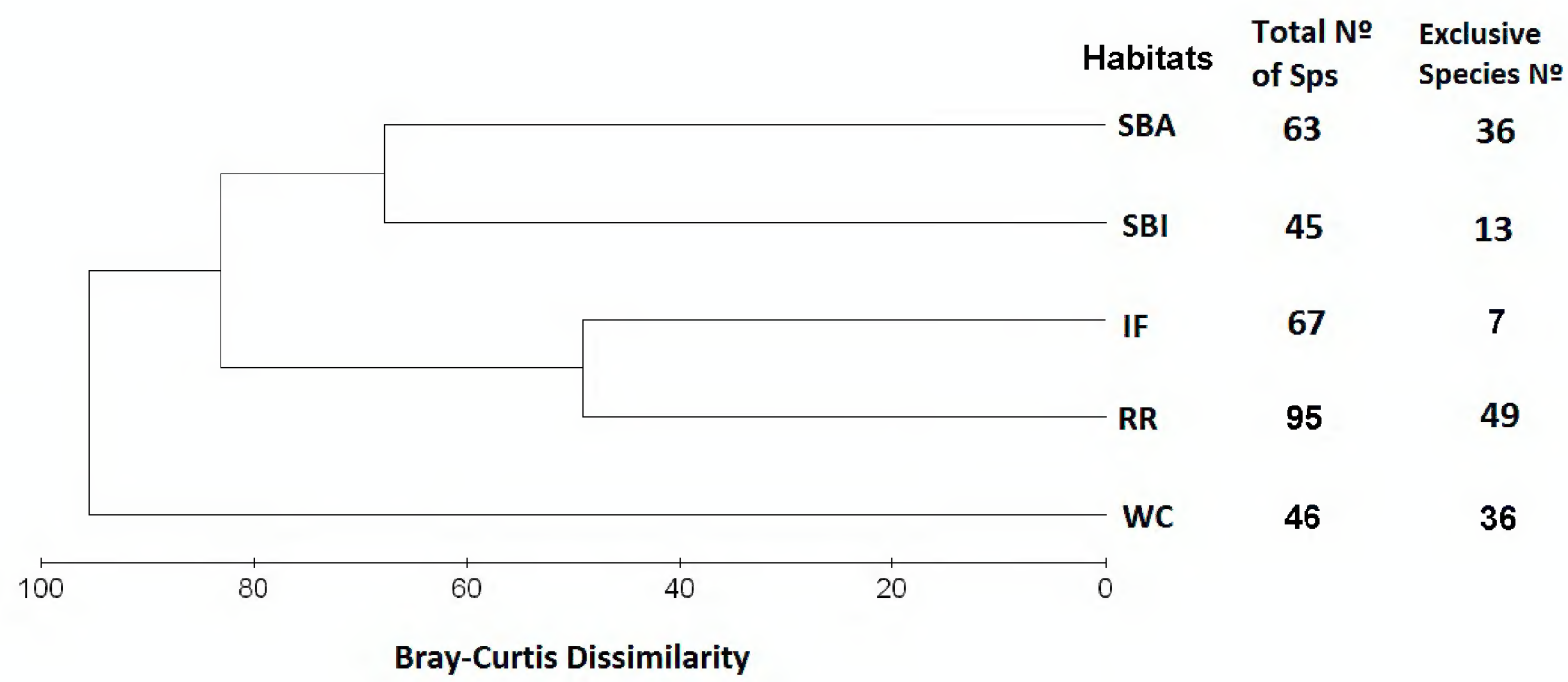

Figure 8. Cluster analysis (Bray Curtis dissimilarity) of habitats found in the Franceses Island and adjacent area. The total number and exclusive number of species are shown for each habitat. RR=rocky reefs; IF=interface; SBI=soft bottom of the island; WC=water column; SBA=soft bottom adjacent to the island.

Table 1. Checklist of fishes from Franceses Island and adjacent environments, southeast Brazil. Abundance (AB = abundant; VC = very common; CO = common; OC = occasional; UN = unusual; RA = rare). Habitat (RR=rocky reefs; IF=interface; SBI=soft bottom of the island; WC=water column; SBA=soft bottom adjacent to the island). Threat (PF=professional fishing; RF=recreational fishing; EN=endangered IBAMA 2014; RO=risk of over-exploitation IBAMA 2003a, b; IU=IUCN red list; DD=data deficient by IUCN evaluation; NR=not at risk). Record type (COL = Collected, MUS = Museum voucher, LIT =Literature, PHO = Photograph/video and SIG = Sighting).

Family	Species	Abundance	Habitat	Threat	Record type
Acanthuridae	*Acanthurus bahianus* Castelnau,1855	AB	RR, IF	PF, RF	MUS
	Acanthurus chirurgus (Bloch,1787)	AB	RR, IF	PF, RF	MUS
	Acanthurus coeruleus Bloch & Schneider,1801	AB	RR	RF	MUS
Apogonidae	*Apogon americanus* Castelnau, 1855	CO	RR	NR	MUS
	Phaeoptyx pigmentaria (Poey, 1860)	CO	RR	NR	MUS
Ariidae	*Cathorops spixii* (Spix & Agassiz, 1829)	UN	SBA	PF	LIT
	Bagre bagre (Linnaeus, 1766)	UN	SBA	PF	COL
	Genidens genidens (Cuvier, 1829)	UN	SBA	PF	COL
	Aspistor luniscutis (Valenciennes, 1840)	UN	SBA	PF	LIT
Atherinidae	*Atherinella brasiliensis* (Quoy & Gaimard, 1825)	UN	SBI	NR	COL
Aulostomidae	*Aulostomus strigosus* Wheeler, 1955	OC	RR	RF	SIG
Achiridae	*Achirus declivis* Chabanaud, 1940	VC	SBA	PF	MUS
	Achirus lineatus (Linnaeus,1758)	VC	SBA	PF	LIT
Balistidae	*Balistes capriscus* Gmelin, 1789*	UN	WC	RF	SIG
	Balistes vetula Linnaeus,1758	OC	WC, RR	RF, IU	SIG
Belonidae	*Strongylura marina* (Walbaum, 1792)	OC	WC	PF, RF	MUS
	Tylosurus acus (Lacepède, 1803)	OC	WC	PF	MUS
Blenniidae	*Hypleurochilus pseudoaequipinnis* Bath, 1994	OC	RR	NR	MUS
	Hypsoblennius invemar Smith-Vaniz & Acero P., 1980	OC	RR	NR	MUS
	Parablennius marmoreus (Poey, 1876)	VC	RR	NR	MUS
	Parablennius pilicornis (Cuvier,1829)	UN	RR	NR	COL
	Scartella cristata (Linnaeus, 1758)	VC	RR	NR	MUS
Bothidae	*Bothus ocellatus* (Agassiz,1831)	UN	SBA	PF	COL
	Bothus robinsi Topp & Hoff, 1972	UN	SBA	PF	COL
Carangidae	*Carangoides bartholomaei* (Cuvier, 1833)	OC	WC	PF, RF	MUS
	Caranx crysos (Mitchill,1815) #	CO	WC	PF, RF	MUS
	Caranx hippos (Linnaeus,1766) #	OC	WC	PF, RF	SIG
	Caranx latus Agassiz,1831 #	CO	WC	PF, RF	MUS
	Caranx ruber (Bloch, 1793)	OC	WC	PF	SIG
	Chloroscombrus chrysurus (Linnaeus, 1766)	VC	WC, SBA	PF, RF	MUS
	Decapterus punctatus (Cuvier, 1829)	OC	WC	PF	MUS
	Oligoplites saliens (Bloch,1793)	OC	WC	PF, RF	COL
	Pseudocaranx dentex (Bloch & Schneider,1801)	UN	WC	NR	PHO
	Selene brownii (Cuvier, 1816)	CO	WC	PF	COL
	Selene setapinnis (Mitchill,1815)	OC	WC	NR	MUS
	Selene vomer (Linnaeus,1758)	CO	WC	PF	MUS
	Trachinotus carolinus (Linnaeus,1766) #	UN	WC	RF	SIG
	Trachinotus goodei Jordan & Evermann,1896	OC	WC	PF, RF	COL
	Trachinotus marginatus Cuvier,1832	UN	WC	RF	SIG
Centropomidae	*Centropomus parallelus* Poey, 1860*	UN	RR	NR	SIG
	Centropomus undecimalis (Bloch,1792)*	OC	RR	PF, RF	SIG
Chaetodontidae	*Chaetodon sedentarius* Poey, 1860	UN	RR, IF	NR	SIG
	Chaetodon striatus Linnaeus,1758	VC	RR, IF	NR	COL
Clupeidae	*Chirocentrodon bleekerianus* (Poey,1867)	AB	SBA	PF	MUS
	Harengula clupeola (Cuvier,1829)	VC	WC, SBA	PF	MUS
	Odontognathus mucronatus Lacepède,1800	CO	SBA	PF	MUS
	Opisthonema oglinum (Lesuer, 1818)	CO	WC, SBA	PF	MUS
	Pellona harroweri (Fowler,1917)	AB	SBA	PF	MUS
	Sardinella brasiliensis (Steindachner,1879)	OC	WC	RO, PF	MUS
Cynoglossidae	*Symphurus plagusia* (Bloch &Schneider, 1801)	VC	SBA	PF	LIT
	Symphurus tessellatus (Quoy & Gaimard, 1824)	VC	SBA	PF	MUS
Dactylopteridae	*Dactylopterus volitans* (Linnaeus,1758)	CO	SBI, SBA	PF, RF	LIT
Dasytidae	*Dasyatis guttata* (Bloch & Schneider,1801)*	OC	IF, SBI, SBA	PF, RF, DD	LIT

Continued

Table 1. *Continued.*

Family	Species	Abundance	Habitat	Threat	Record type
Diodontidae	*Chilomycterus reticulatus* (Linnaeus, 1758)	CO	RR	NR	MUS
	Cyclichthys spinosus (Linnaeus, 1758)	AB	IF, SBI, SBA	PF	MUS
	Diodon histrix Linnaeus,1758	CO	RR	NR	PHO
Echeneidae	*Echeneis naucrates* Linnaeus,1758	UN	WC	PF	SIG
Elopidae	*Elops saurus* Linnaeus,1766	OC	WC	PF	MUS
Engraulidae	*Anchoa filifera* (Fowler,1915)	CO	WC, SBA	PF	MUS
	Anchoa spinifer (Valenciennes,1848)	CO	WC, SBA	PF	LIT
	Anchoviella lepidentostole (Fowler,1911)	UN	WC	PF	COL
	Cetengraulis edentulus (Cuvier,1829)	UN	WC, SBA	PF	MUS
	Lycengraulis grossidens (Spix & Agassiz, 1829)	UN	WC	PF	COL
Epinephelidae	*Alphestes afer* (Bloch,1793)*	RA	RR	RF	PHO
	Epinephelus itajara (Lichtenstein,1822)	RA	RR	EN, RF, IU	SIG
	Mycteroperca acutirostris (Valenciennes,1828)*	CO	RR, IF	RF	SIG
	Mycteroperca bonaci (Poey, 1860) #	CO	RR, IF	EN, PF, RF	COL
	Epinephelus marginatus (Lowe, 1834)	RA	RR	EN, RF, IU	SIG
	Rypticus bistrispinus (Mitchill, 1818)	RA	RR	NR	SIG
	Rypticus saponaceus (Bloch & Schneider, 1801)	VC	RR	RF	MUS
Ephippidae	*Chaetodipterus faber* (Broussonet,1782)	OC	WC	PF, RF	MUS
Fistulariidae	*Fistularia tabacaria* Linnaeus,1758	UN	RR	NR	SIG
Gerreidae	*Diapterus auratus* Ranzani, 1842	UN	SBI	PF	MUS
	Diapterus olisthostomus (Goode & Bean, 1882)	UN	SBI	NR	COL
	Eucinostomus argenteus Baird & Girard, 1855	CO	SBI	PF	MUS
	Eucinostomus lefroyi (Goode, 1874)	VC	SBI	PF	MUS
	Eugerres brasilianus (Cuvier, 1830)	OC	RR	RF	PHO
Ginglymostomatidae	*Ginglymostoma cirratum* (Bonnaterre,1788)	RA	IF	EN, RF, DD	SIG
Gobiesocidae	*Gobiesox barbatulus* Starks, 1913	RA	RR	NR	COL
	Tomicodon australis Briggs, 1955	OC	RR	NR	COL
Gobiidae	*Bathygobius geminatus* Tornabene, Baldwin & Pezold, 2010	CO	RR	NR	MUS
	Bathygobius soporator (Valenciennes, 1837)	OC	RR	NR	SIG
	Coryphopterus dicrus Böhlke & Robins, 1960	VC	IF	NR	MUS
	Coryphopterus glaucofraenum Gill, 1863	VC	IF	NR	MUS
	Ctenogobius saepepallens (Gilbert & Randall, 1968)	CO	IF	NR	MUS
	Elacatinus figaro Sazima, Moura & Rosa, 1997	UN	RR	EN	SIG
	Gnatholepis thompsoni Jordan, 1904	OC	IF	NR	COL
	Gobiidae not identified	UN	SBA	NR	SIG
Grammatidae	*Gramma brasiliensis* Sazima, Gasparini & Moura, 1998 *	VC	RR	PF	PHO
Gymnuridae	*Gymnura altavela* (Linnaeus,1758)	OC	IF, SBI, SBA	EN, PF, IU	LIT
Haemulidae	*Anisotremus moricandi* (Ranzani, 1842)	VC	RR, IF	RF, IU	MUS
	Anisotremus surinamensis (Bloch,1791)	AB	RR	RF	MUS
	Anisotremus virginicus (Linnaeus,1758)	AB	RR, IF	PF, RF	PHO
	Conodon nobilis (Linnaeus,1758)	VC	SBA	PF	MUS
	Haemulon aurolineatum Cuvier, 1830	AB	RR, IF, SBI	PF	MUS
	Haemulon parra (Desmarest, 1823)	CO	RR, IF	PF, RF	MUS
	Haemulon plumierii (Lacepède, 1801)	VC	RR, IF	PF, RF	MUS
	Haemulon steindachneri (Jordan & Gilbert, 1882)	AB	RR, IF, SBI	PF, RF	MUS
	Orthopristis ruber (Cuvier,1830)	VC	IF, SBI, SBA	PF, RF	PHO, LIT
Hemiramphidae	*Hemiramphus balao* Lesueur, 1821	OC	WC	NR	PHO
	Hemiramphus brasiliensis (Linnaeus,1758)	VC	WC	PF	COL
	Hyporhamphus unifasciatus (Ranzani,1841)	UN	WC	PF	MUS
Holocentridae	*Holocentrus adscensionis* (Osbeck,1765)	AB	RR, IF, SBI	RF	MUS
	Myripristis jacobus Cuvier, 1829	VC	RR	NR	MUS
Kyphosidae	*Kyphosus sectatrix* (Linnaeus, 1758)	VC	WC	PF, RF	COL
Labridae	*Bodianus rufus* (Linnaeus,1758)	AB	RR, IF	RF	PHO
	Cryptotomus roseus Cope, 1871	UN	RR	NR	SIG
	Doratonotus megalepis Günther, 1862	UN	RR	NR	SIG
	Halichoeres brasiliensis (Bloch, 1791)	VC	RR, IF	RF, DD	MUS
	Halichoeres penrosei Starks, 1913	OC	RR	NR	SIG
	Halichoeres poeyi (Steindachner,1867)	AB	RR, IF	RF	MUS
	Scarus trispinosus Valenciennes, 1840	RA	RR	EN, RF, IU	SIG

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Table 1. *Continued.*

Family	Species	Abundance	Habitat	Threat	Record type
	Sparisoma amplum (Ranzani, 1841)	RA	RR	EN	SIG
	Sparisoma axillare (Steindachner, 1878) #	AB	RR, IF	EN, PF, RF, DD	PHO
	Sparisoma frondosum (Agassiz, 1831) #	VC	RR	EN, RF, DD	PHO
	Sparisoma radians (Valenciennes, 1840)	OC	RR, IF	NR	SIG
	Sparisoma tuiupiranga Gasparini, Joyeux & Floeter, 2003	UN	RR, IF	NR	SIG
	Thalassoma noronhanum (Boulenger, 1890)	UN	RR	NR	SIG
Labrisomidae	*Labrisomus cricota* Sazima, Gasparini & Moura, 2002	OC	RR	NR	PHO
	Labrisomus kalisherae (Jordan,1904)	OC	RR, IF	NR	MUS
	Labrisomus nuchipinnis (Quoy & Gaimard, 1824)	AB	RR, IF	RF	PHO
	Malacoctenus delalandi (Valenciennes, 1836)	AB	RR, IF	NR	MUS
	Malacoctenus aff. *triangulatus* Springer, 1959	VC	RR, IF	NR	MUS
	Paraclinus arcanus Guimarães & Bacellar, 2002	RA	SBI	NR	MUS
Lutjanidae	*Lutjanus analis* (Curvier,1828)	UN	RR, IF	RO, PF, RF, IU	SIG
	Lutjanus cyanopterus (Cuvier, 1828)	UN	RR	EN, RF, IU	SIG
	Lutjanus jocu (Bloch & Schneider,1801) #	VC	RR, IF	RF	MUS
	Lutjanus synagris (Linnaeus,1758) #	CO	IF, SBI	PF, RF	PHO
	Ocyurus chrysurus (Bloch, 1791)	CO	IF, SBI	RO, PF	MUS
Malacanthidae	*Malacanthus plumieri* (Bloch, 1786)	UN	SBI	NR	SIG
Monacanthidae	*Aluterus scriptus* (Osbeck, 1765)	OC	RR	NR	SIG
	Cantherhines pullus (Ranzani, 1842)	CO	RR, IF	NR	MUS
	Stephanolepis hispidus (Linnaeus,1766)	UN	RR, IF, SBI	PF	COL
Mugilidae	*Mugil incilis* Hancock, 1830	CO	WC	PF, RF	COL
	Mugil liza Valenciennes,1836	CO	WC	RO, PF, RF	MUS
Mullidae	*Pseudupeneus maculatus* (Bloch,1793)	VC	RR, IF, SBI	PF	MUS
Muraenidae	*Gymnothorax funebris* Ranzani,1839	CO	RR	RF	PHO
	Gymnothorax moringa (Cuvier,1829)	VC	RR, IF	RF	PHO
	Gymnothorax ocellatus Agassiz,1831	CO	SBA	PF	MUS
	Gymnothorax vicinus (Castelnau,1855)	UN	RR	RF	COL
Myliobatidae	*Aetobatus narinari* (Euphrasen,1790)*	OC	WC	PF	PHO
Narcinidae	*Narcine brasiliensis* (Olfers,1831)*	UN	IF, SBI, SBA	PF, DD	SIG
Ogcocephalidae	*Ogcocephalus vespertilio* (Linnaeus,1758)	OC	SBI, SBA	PF	SIG, LIT
Ophichthidae	*Myrichthys breviceps* (Richardson, 1848)	UN	SBI, RR	NR	PHO
	Myrichthys ocellatus (Lesueur, 1825)	OC	SBI, RR	NR	SIG
	Ophichthus gomesii (Castelnau,1855)	UN	SBA	PF	LIT
	Ophichthus ophis (Linnaeus, 1758)	UN	SBI	RF	MUS
	Ahlia egmontis (Jordan, 1884)	UN	IF, SBI	NR	SIG
Ostraciidae	*Acanthostracion polygonius* Poey,1876	CO	RR	NR	SIG
	Acanthostracion quadricornis (Linnaeus,1758)	CO	RR	PF	SIG
Paralichthyidae	*Citharichthys macrops* Dresel, 1885	CO	SBA	PF	MUS
	Citharichthys spilopterus Günther, 1862	CO	SBA	PF	MUS
	Etropus crossotus Jordan & Gilbert, 1882	OC	IF, SBI	NR	MUS
	Paralichthys brasiliensis (Ranzani, 1842)	UN	IF	RF	COL
	Syacium cf. *papillosum* (Linnaeus,1758)	OC	IF, SBI	PF	MUS
	Syacium micrurum Ranzani, 1842	OC	IF, SBI	PF	MUS
Pempheridae	*Pempheris schomburgkii* (Müller &Troschel, 1848)	CO	RR	NR	COL
Polynemidae	*Polydactylus oligodon* (Günther, 1860)	UN	SBI, SBA	PF	COL
	Polydactylus virginicus (Linnaeus, 1758)	UN	SBI, SBA	PF	LIT
Pomacanthidae	*Holacanthus ciliaris* (Linnaeus,1758)	CO	RR, IF	NR	PHO
	Holacanthus tricolor (Bloch, 1795)	UN	RR, IF	NR	SIG
	Pomacanthus paru (Bloch,1787)	VC	RR, IF	RF	PHO
	Pomacanthus arcuatus (Linnaeus, 1758)	UN	RR	NR	SIG
Pomacentridae	*Abudefduf saxatilis* (Linnaeus,1758)	AB	RR, IF	RF	MUS
	Chromis multilineata (Guichenot, 1853)	VC	RR, WC	NR	SIG
	Microspathodon chrysurus (Cuvier, 1830)	RA	RR	EN	PHO
	Stegastes fuscus (Cuvier, 1830)	AB	RR, IF	NR	COL
	Stegastes variabilis (Castelnau, 1855)	VC	RR, IF	NR	COL
Pomatomidae	*Pomatomus saltatrix* (Linnaeus,1766)	UN	WC	RO, PF, RF	PHO

Continued

Table 1. *Continued.*

Family	Species	Abundance	Habitat	Threat	Record type
Rhinobatidae	*Rhinobatos horkelii* Müller & Henle, 1841	OC	SBI, SBA	EN, PF, IU	PHO
	Rhinobatos percellens (Walbaum,1792)*	OC	SBI, SBA	PF	MUS
	Zapteryx brevirostris (Müller & Henle,1841)	OC	SBI, SBA	EN, PF, IU	MUS
Sciaenidae	*Ctenosciaena gracilicirrhus* (Metzelaar,1919)	AB	SBA	PF	LIT
	Cynoscion acoupa (Lacepède, 1801)	UN	SBA	PF	MUS
	Cynoscion jamaicensis (Vaillant & Bocourt,1883)	AB	SBA	PF	LIT
	Cynoscion leiarchus (Cuvier, 1830)	UN	SBA	PF	MUS
	Cynoscion virescens (Cuvier, 1830)*	CO	SBA	PF	LIT
	Isopisthus parvipinnis (Cuvier, 1830)	AB	SBA	PF	LIT
	Larimus breviceps Cuvier, 1830	AB	SBA	PF	MUS
	Macrodon ancylodon (Bloch & Schneider, 1801)	CO	SBA	RO, PF	COL
	Menticirrhus americanus (Linnaeus, 1758)	VC	SBA	PF	MUS
	Micropogonias furnieri (Desmarest, 1823)	VC	SBA	RO, PF	MUS
	Nebris microps Cuvier, 1830	OC	SBA	PF	LIT
	Odontoscion dentex (Cuvier, 1830)	VC	RR, IF	NR	SIG
	Paralonchurus brasiliensis (Steindachner,1875)	AB	SBA	PF	MUS
	Pareques acuminatus (Bloch & Schneider, 1801)	VC	RR, IF	NR	MUS
	Stellifer brasiliensis (Schultz,1945)	AB	SBA	PF	MUS
	Stellifer naso (Jordan, 1889)	OC	SBA	PF	MUS
	Stellifer rastrifer (Jordan,1889)	AB	SBA	PF	MUS
	Umbrina coroides Cuvier, 1830	UN	SBA	PF	LIT
Scombridae	*Euthynnus alletteratus* (Rafinesque, 1810)	OC	WC	PF	COL
	Scomberomorus cavalla (Cuvier, 1829)	OC	WC	PF	PHO
	Scomberomorus brasiliensis Collette, Russo & Zavala-Camin, 1978	VC	WC	PF, RF	MUS
Scorpaenidae	*Scorpaena brasiliensis* Cuvier, 1829	OC	RR	NR	COL
	Scorpaena isthmensis Meek & Hildebrand, 1928	OC	RR, SBA	PF	MUS, LIT
	Scorpaena plumieri Bloch,1789	VC	RR, IF	NR	COL
Serranidae	*Diplectrum formosum* (Linnaeus,1766)	VC	IF, SBI, SBA	PF, RF	MUS
	Diplectrum radiale (Quoy & Gaimard, 1824)	VC	IF, SBI	NR	COL
	Serranus baldwini (Evermann & Marsh, 1899)	OC	RR	NR	PHO
	Serranus flaviventris (Cuvier, 1829)	CO	RR, IF	NR	MUS
Sparidae	*Archosargus probatocephalus* (Walbaum,1792)*	CO	RR	RF	SIG
	Archosargus rhomboidalis (Linnaeus,1758)	UN	SBI	PF	MUS
	Calamus penna (Valenciennes, 1830)	OC	IF, SBI	PF	MUS
	Diplodus argenteus (Valenciennes,1830)	VC	RR	PF, RF	MUS
	Pagrus pagrus (Linnaeus, 1758)	OC	IF, SBI	RO, IU	SIG
Sphyraenidae	*Sphyraena guachancho* Cuvier, 1829	UN	WC	PF	MUS
	Sphyraena tome Fowler, 1903	CO	WC	PF	MUS
Stromateidae	*Peprilus paru* (Linnaeus,1758)	CO	WC, SBA	PF	MUS
Syngnathidae	*Microphis brachyurus lineatus* (Kaup, 1856)	RA	SBA	NR	LIT
	Syngnathinae not identified	RA	SBI	NR	SIG
	Hippocampus reidi Ginsburg,1933 #	CO	IF	EN, DD	PHO
Synodontidae	*Synodus intermedius* (Spix & Agassiz, 1829)	CO	SBI	NR	MUS
	Synodus synodus (Linnaeus, 1758)	CO	SBI	NR	PHO
Tetraodontidae	*Canthigaster figueiredoi* Moura & Castro, 2002	CO	RR, IF	NR	SIG
	Lagocephalus laevigatus (Linnaeus,1766)	CO	SNI, SNA	PP	SIG
	Sphoeroides greeleyi Gilbert,1900	CO	IF, SBI, SBA	NR	LIT
	Sphoeroides pachygaster (Müller & Troschel,1848)	OC	IF, SBI, SBA	NR	LIT
	Sphoeroides spengleri (Bloch,1785)	VC	RR, IF	RF	MUS
	Sphoeroides testudineus (Linnaeus,1758)	OC	IF, SBI, SBA	RF	LIT
Trichiuridae	*Trichiurus lepturus* Linnaeus,1758	VC	WC, SBA	PF	MUS
Triglidae	*Prionotus punctatus* (Bloch, 1793)	OC	IF, SBA	PF	MUS

* Species considered at risk in Espírito Santo state by the authors (see discussion); # Species targeted of a redirection of local fishery activities (due to the collapse of bigger and more valuable species).

even with a small and shallow reef area, displays a large diversity of micro-habitats, such as rocky shores, one beach, emerged and submerged reefs and patch reefs, rhodolith and bioclastic material beds, sand and mud bottoms, and macroalgae beds, distributed in areas sheltered and exposed to winds and waves. This diversity of habitats can contribute to the high species richness found in the Franceses Islands.

Additionally, some oceanographic features of Espírito Santo State (Schmid et al. 1995) make this region a transitional zone between Brazilian Northeastern (tropical) and Southern (subtropical) coast (Martins et al. 2007),

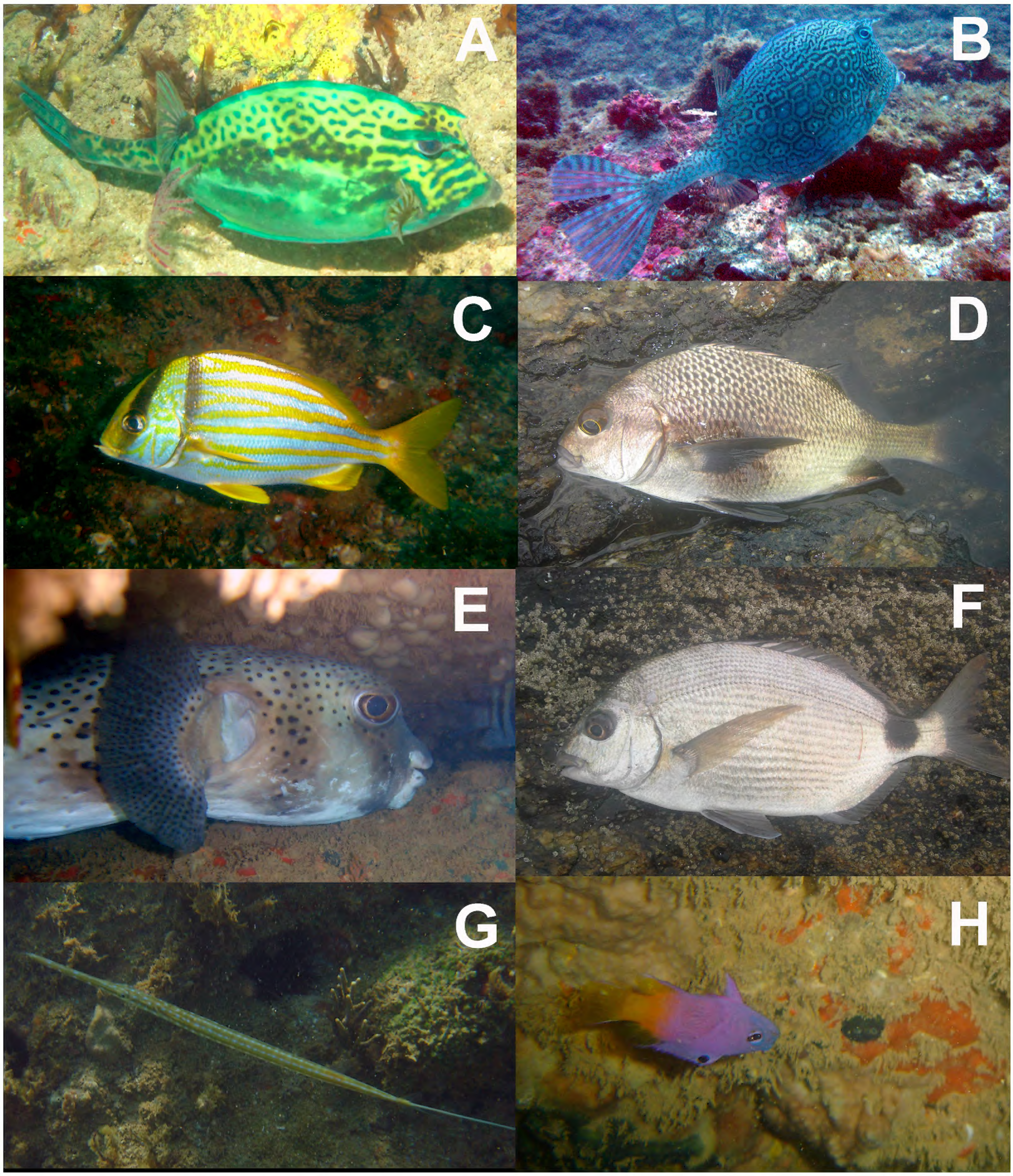

Figure 2. Species recorded on the rocky reefs of Franceses Island, Espírito Santo southern coast, Brazil. A) *Acanthostracion quadricornis*, B) *Acanthostracion polygonius*, C) *Anisotremus virginicus*, D) *Anisotremus surinamensis*, E) *Chilomycterus reticulatus*, F) *Diplodus argenteus*, G) *Fistularia tabacaria*, H) *Gramma brasiliensis*.

what contribute to an increase in local fish diversity. At least four species (*Selene brownii*, *Selene setapinnis*, *Bathygobius mystacium* and *Anisotremus moricandi*) have the Espírito Santo state as their south distribution edge, while other four species (*Epinephelus marginatus*, *Sphyraena tome*, *Rhinobatos horkelii* and *Zapteryx brevirostris*) have this state as their north distributional edge.

Diversity and dissimilarity analyses among the distinct habitats studied highlight some points. Although RR and IF habitats show the highest richness, the low exclusive species richness of IF and high similarity of both habitats indicate an overlap among species, which

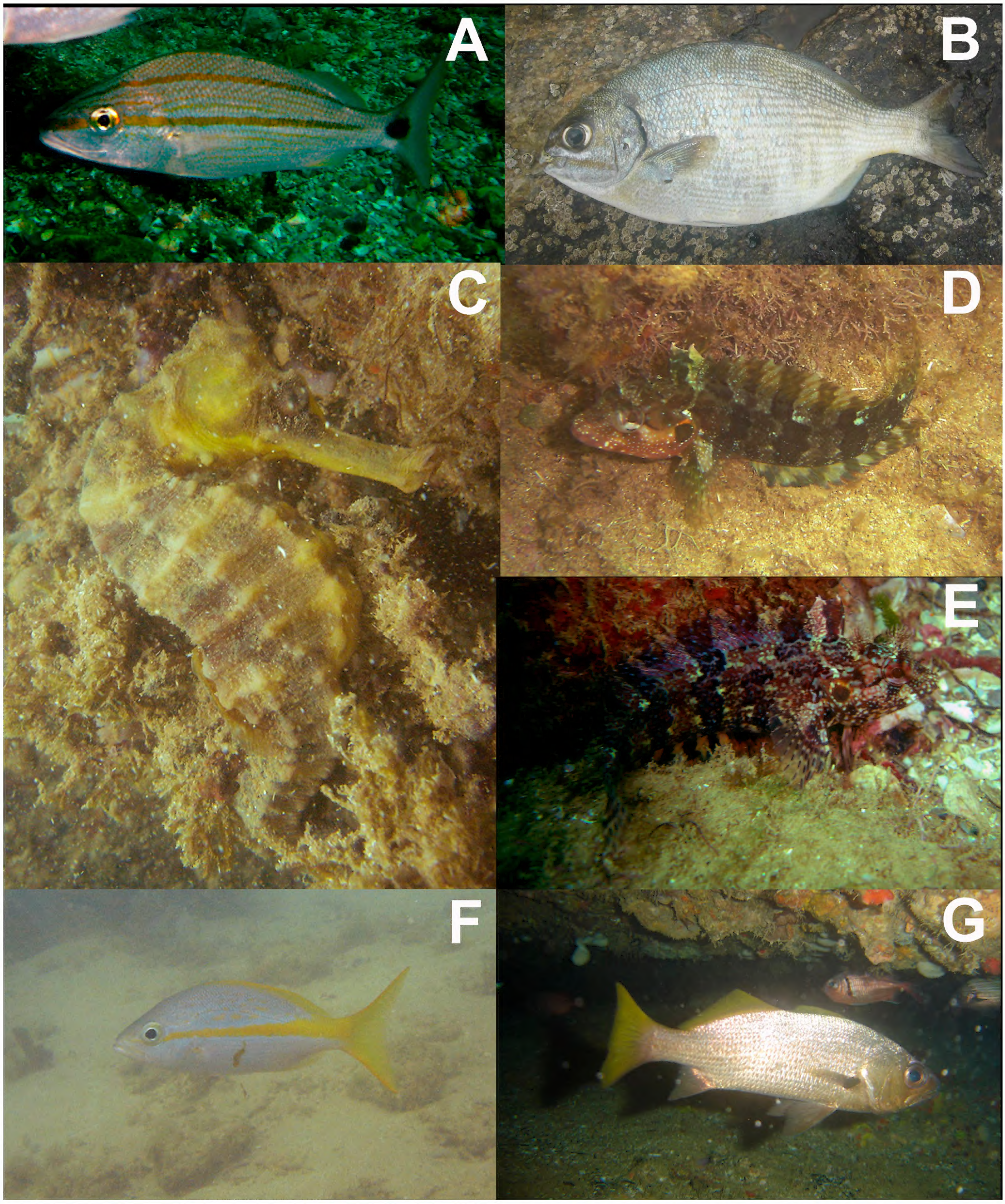

Figure 3. Species recorded on the rocky reefs of Franceses Island, Espírito Santo southern coast, Brazil. A) *Haemulon aurolineatum*, B) *Kyphosus sectatrix*, C) *Hippocampus reidi*, D) *Labrisomus cricota* (male), E) *Labrisomus cricota* (female), F) *Ocyurus chrysurus*, G) *Odontoscion dentex*.

can be related with the geographical proximity and habitat plasticity of species. The similarity of SBI and SBA, even not too high, suggest that many species found in demersal unconsolidated bottoms, even not characterized as reef fishes, can explore and be recorded in island surroundings habitats, increasing the local richness. Else, WC habitat has the most distinct fauna, showing high exclusive species richness. The majority of species of this habitat used to occur in schools and have a seasonal presence in the area (Froese and Pauly 2014;

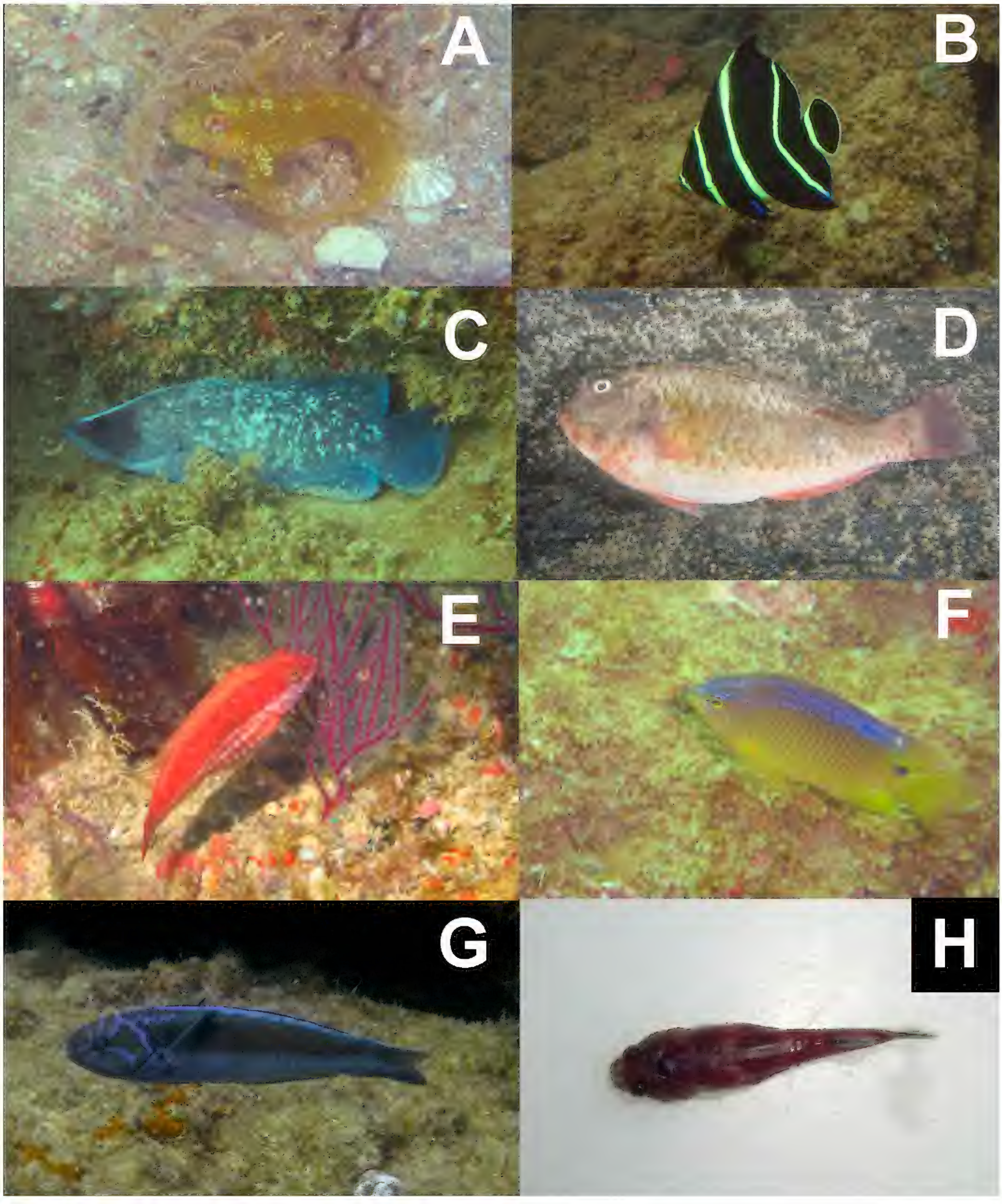

Figure 4. Species recorded on the rocky reefs of Franceses Island, Espírito Santo southern coast, Brazil. A) *Parablennius marmoreus* (yellow morph), B) *Pomacanthus paru*, C) *Rypticus saponaceus*, D) *Sparisoma axillare*, E) *Sparisoma tuiupiranga*, F) *Stegastes variabilis*, G) *Thalassoma noronhanum*, H) *Tomicodon australis*.

personal observation). Thus, the mosaic of seascape, habitat plasticity of many species and seasonal visitant species can also contribute to the high fish diversity found in the studied island.

Moura and Francini-Filho (2005) state that due to the high endemism and large risks Brazilian reefs can be considered a hotspot inside the Atlantic Ocean, so, in need of an immediate attention from scientists and conservationists. Espírito Santo coast, considered a marine transitional zone and a faunal boundary (Floeter et al. 2001; Martins et al. 2007), should receive a special care. Boundary regions are normally very sensitive to climate and environmental changes (Peters 1994), and depend on the preservation of natural areas for the maintenance of its communities.

Apart of the fact that it contains a representative

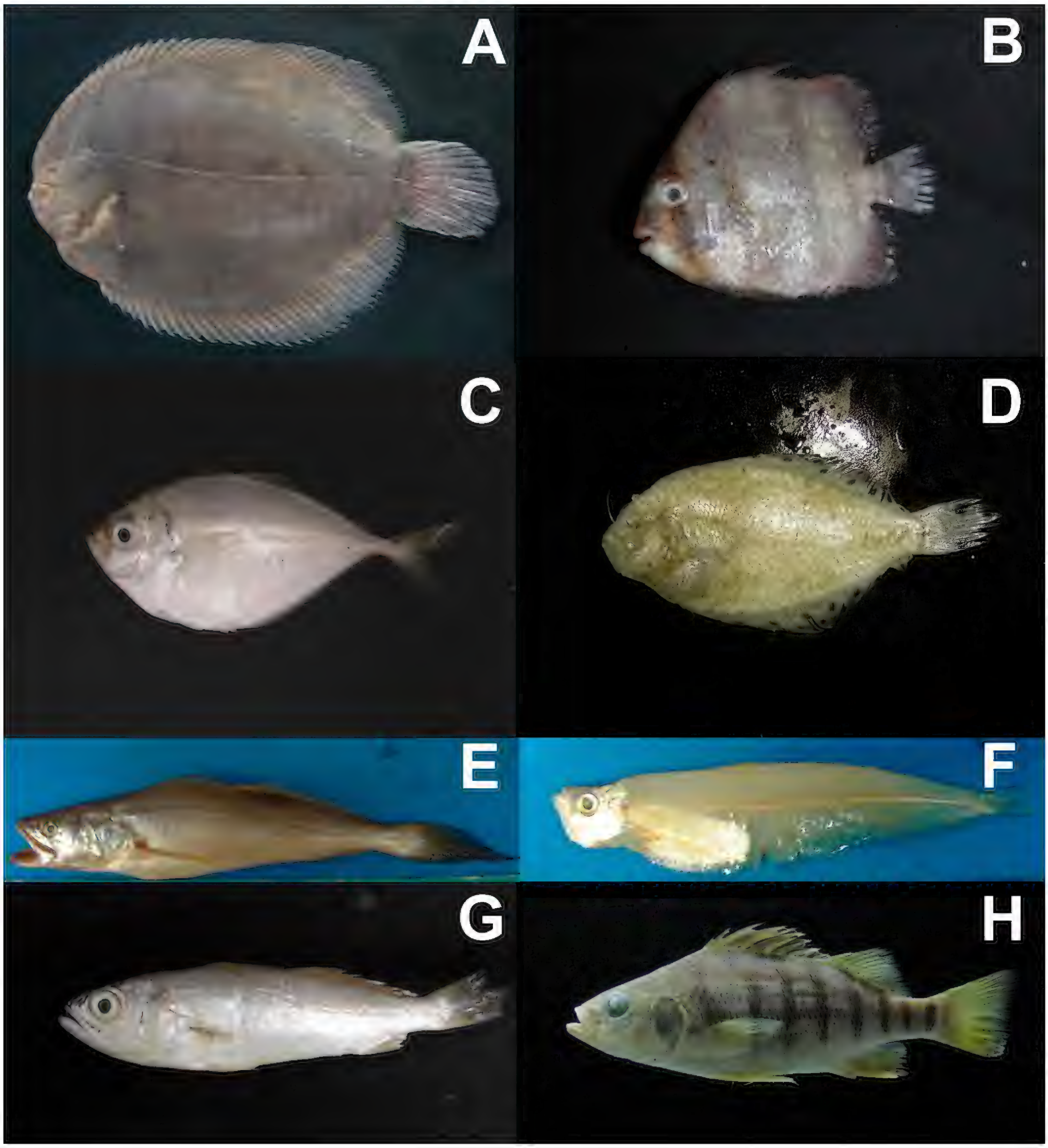

Figure 5. Species recorded on soft bottom habitats around Franceses Island, Espírito Santo southern coast, Brazil. A) *Achirus declivis*, B) *Chaetodipterus faber*, C) *Chloroschombrus chrysurus*, D) *Citharichthys macrops*, E) *Cynoscion virescens*, F) *Chirocentrodon bleekerianus*, G) *Cynoscion jamaicensis*, H) *Conodon nobilis*.

portion of the Brazilian reef fish diversity (35%), Franceses Island also hosts endangered and over-exploited species, as well as several species of commercial and recreational importance. However, the isle has suffered different kinds of impacts, such as increase of sedimentation from two hydrographic basis, uncontrolled tourism and overfishing (Pinheiro et al. 2009b, 2010a, 2010b). These impacts threaten reef areas worldwide and have a high potential to change reef fish community structure. Moreover, some species registered at Franceses Island deserve further attention for an adequate classification of risk. Eight species are considered endangered by Brazilian red list but not by IUCN evaluations. Four species, including a Brazilian endemic, are considered threatened by IUCN but not for Brazilian red lists (Table 1).

Franceses Island reefs seem to be a nursery area for nine endangered species (*E. marginatus, G. cirratum, L. analis*, *L. cyanopterus*, *M. bonaci*, *S. trispinosus*, *S. amplum*, *S. axillare*, *S. frondosum*), all targeted by local fishing activities (Table 1). Three endangered elasmobranchs, *G. altavela*, *R. horkelii* and *Z. brevirostris*, have been highly threatened around Franceses Island, as well in other areas of the ES, as by-catch by trawling activities (Pinheiro and Martins 2009; Pinheiro et al. 2009a). Summing to these examples, there are other 12 species (highlighted in Table 1) found at Franceses Island that are not considered threatened neither by IUCN nor by Brazilian lists, but that have populations in risk at Espírito Santo state (pers. obs.), thus deserving a special attention for analysis and classification of risk (six of these are predicted to have a high extinction risk in Brazil; Bender et al. 2012). Other ten species, also pointed

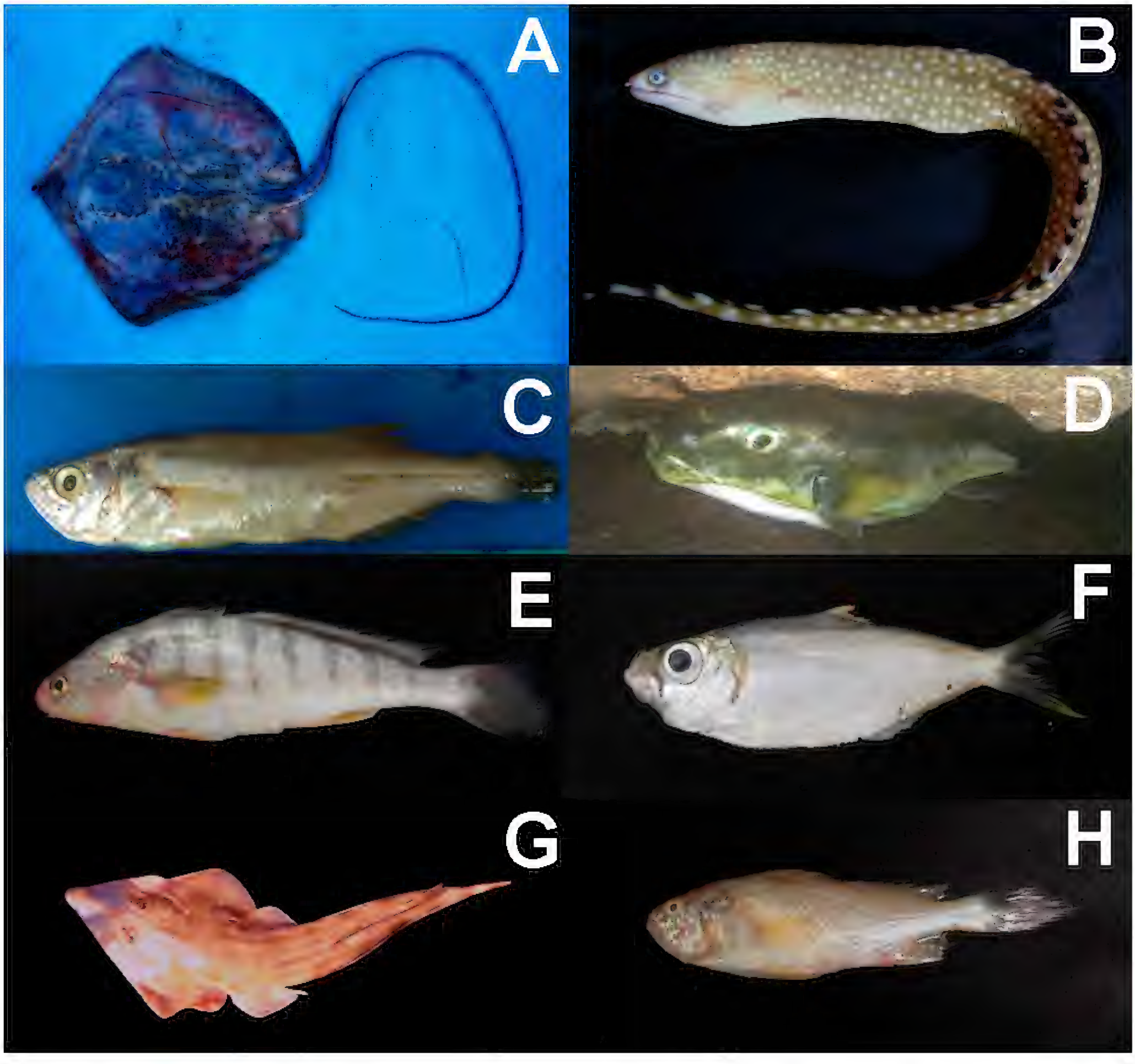

Figure 6. Species recorded on soft bottom habitats around Franceses Island, Espírito Santo southern coast, Brazil. A) *Dasyatis guttata*, B) *Gymnothorax ocellatus*, C) *Isopisthus parvipinnis*, D) *Lagocephalus laevigatus*, E) *Paralonchurus brasiliensis*, F) *Pellona harroweri*, G) *Rhinobatos horkelii*, H) *Stellifer rastrifer*.

in Table 1, are common but have been recently target of local fishing since the collapse of bigger and more valuable species, so deserve attention and monitoring by managers in Espírito Santo and Brazil.

Although there is a necessity of improvement of catch regulations, the full protection of habitats has been essential for resource recovery and biodiversity conservation. In this context, Brazilian Environmental Ministry has tried to implement a policy of MPAs creation targeting the goals of the Aichi Convention. Despite that, Brazil has less than 2% of its marine area effectively protected, and in many cases the establishment of MPAs looks like a political deal or exchange by the aggressive and accelerate industrial growth that is happening and impacting several Brazilian coastal areas (pers. obs.). Presently, management organizations and NGOs are working towards the creation of a MPA in the southern coast of Espírito Santo. The inclusion of Franceses Island and adjacent habitats in a no-take zone can collaborate to the protection of a high biodiversity

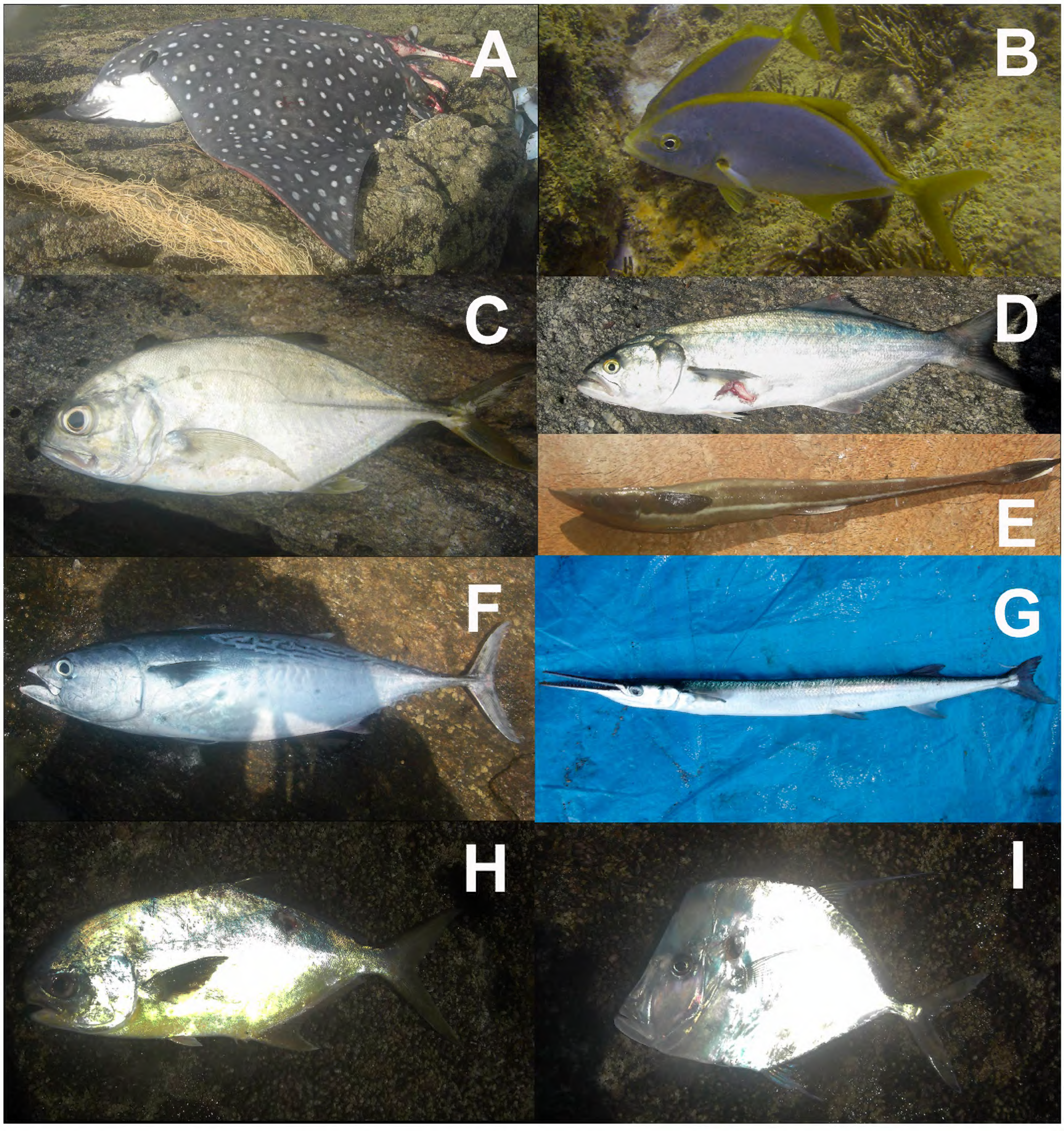

Figure 7. Species recorded in the water column around Franceses Island, Espírito Santo southern coast, Brazil. A) *Aetobatus narinari*, B) *Carangoides bartholomaei*, C) *Caranx latus*, D) *Pomatomus saltatrix*, E) *Echeneis naucrates*, F) *Euthynnus alletteratus*, G) *Tylosurus acus*, H) *Trachinotus carolinus*, I) *Selene vomer*.

area, sustainability of surrounding artisanal fishing and management and valorization of the local tourism.

NOTE

The Brazilian Red List was recently upgraded (IBAMA 2014), with many species added. Regarding reef fishes, four species we considered in the present work to be highly endangered in the Espírito Santo state (*L. cyanopterus*, *S. trispinosus*, *G. altavela* and *Z. brevirostris*) had their endangered status updated to either vulnerable or critically endangered. On the other hand, *Gramma brasiliensis*, highly targeted for the ornamental trade but rare at Franceses Island, dropped out the Red List. The official status of the other species did not change.

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Appendix 1. Species name, institution and voucher number of specimens deposited in museum collections (Table 2).

Table 2. Species name, institution and voucher number of specimens collected in Franceses Island (Espírito Santo state, Brazil) and deposited in museum collections.

Species	Voucher ID
Abudefduf saxatilis	CIUFES 1034
Acanthurus bahianus	CIUFES 1928
Acanthurus chirurgus	CIUFES 1978
Acanthurus coeruleus	CIUFES 1979
Achirus declivis	CIUFES 1934
Anchoa filifera	CIUFES 768
Anisotremus moricandi	CIUFES 1960
Anisotremus surinamensis	CIUFES 1961
Apogon americanus	CIUFES 766, 807
Archosargus rhomboidalis	CIUFES 1977
Bathygobius geminatus	CIUFES 1040
Calamus penna	CIUFES 490, 1908
Cantherhines pullus	CIUFES 1980
Carangoides bartholomaei	CIUFES 1970
Caranx crysos	CIUFES 1035, 1929
Caranx latus	CIUFES 1930
Cetengraulis edentulus	CIUFES 1943
Chaetodipterus faber	CIUFES 1899, 1903
Chilomycterus reticulatus	CIUFES 929
Chirocentrodon bleekerianus	CIUFES 1922
Chloroschombrus chrysurus	CIUFES 1931
Citharichthys macrops	CIUFES 804
Citharichthys spilopterus	CIUFES 1935
Conodon nobilis	CIUFES 1909
Coryphopterus dicrus	CIUFES 1049
Coryphopterus glaucofraenum	CIUFES 1040
Ctenogobius saepepallens	CIUFES 1048
Cyclichthys spinosus	CIUFES 1948
Cynoscion acoupa	CIUFES 764
Cynoscion leiarchus	CIUFES 1911
Decapterus punctatus	CIUFES 1969
Diapterus auratus	CIUFES 489
Diplectrum formosum	CIUFES 1913
Diplodus argenteus	CIUFES 1973
Elops saurus	CIUFES 1974
Etropus crossotus	CIUFES 1933
Eucinostomus argenteus	CIUFES 492
Eucinostomus lefroyi	CIUFES 491
Gymnothorax ocellatus	CIUFES 1947
Haemulon aurolineatum	CIUFES 1957
Haemulon parra	CIUFES 1968
Haemulon plumieri	CIUFES 1959
Haemulon steindachneri	CIUFES 560, 1907
Halichoeres brasiliensis	CIUFES 1962
Halichoeres poeyi	CIUFES 1955
Harengula clupeola	CIUFES 1963
Holocentrus ascensionis	CIUFES 1965
Hypleurochilus pseudoaequipinnis	CIUFES 783
Hyporhamphus unifasciatus	CIUFES 1914
Hypsoblennius invemar	CIUFES 780
Labrisomus kalisherae	CIUFES 806
Larimus breviceps	CIUFES 765
Lutjanus jocu	CIUFES 1927
Malacoctenus aff triangulatus	CIUFES 1039
Malacoctenus delalandi	CIUFES 801, 1047
Menticirrhus americanus	CIUFES 1897
Micropogonias furnieri	CIUFES 1940
Mugil liza	CIUFES 1976
Myripristis jacobus	CIUFES 1958
Ocyurus chrysurus	CIUFES 1953
Odontognathus mucronatus	CIUFES 1919
Ophichthus ophis	CIUFES 1896
Opisthonema oglinum	CIUFES 1932
Parablennius marmoreus	CIUFES 781
Paraclinus arcanus	CIUFES 809
Paralonchurus brasiliensis	CIUFES 1902
Pareques acuminatus	CIUFES 1964
Pellona harroweri	CIUFES 1926
Peprilus paru	CIUFES 1905
Phaeoptyx pigmentaria	CIUFES 767
Prionotus punctatus	CIUFES 1898
Pseudupeneus maculatus	CIUFES 1956
Rhinobatos percellens	CIUFES 1917
Rypticus saponaceus	CIUFES 1952
Sardinella brasiliensis	CIUFES 1923
Scartella cristata	CIUFES 782, 802
Scomberomorus brasiliensis	CIUFES 1921, 1975
Scorpaena isthmensis	CIUFES 1036
Selene setapinnis	CIUFES 1916
Selene vomer	CIUFES 1915
Serranus flaviventris	CIUFES 1037
Sphoeroides spengleri	CIUFES 1033
Sphyraena guachancho	CIUFES 1920
Sphyraena tome	CIUFES 1966
Stellifer brasiliensis	CIUFES 1904
Stellifer naso	CIUFES 1912
Stellifer rastrifer	CIUFES 1939
Strongylura marina	CIUFES 904
Syacium cf. papillosum	CIUFES 1910
Syacium micrurum	CIUFES 493
Symphurus tessellatus	CIUFES 1936
Synodus intermedius	CIUFES 1971
Trichiurus lepturus	CIUFES 1906
Tylosurus acus	CIUFES 1895, 1900
Zapteryx brevirostris	CIUFES 882